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Annual Progress Report
Grant N00173-98-1-G007 from the the Naval Research Laboratory (NRL)

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Abstract

This is the Annual Progress Report of the project under grant N00173-98-1-G007 from the the Naval Research Lab (NRL). It describes the goal of the project, advances made towards achieving that goal in the first year and a plan to be followed for the second year.

1 Goal of the Project

The main goal of the project is to provide a plan authoring tool for decision support during planning of military operations. This project has been developed under intense collaboration between the Computer Science Department of the University of Maryland and the Navy Center for Applied Research in Artificial Intelligence (NCARAI) at the Naval Research Lab (NRL). Point of contact at NCARAI is Dr. David W. Aha.

The application domain for the decision support tool is Noncombatant Evacuation Operations (NEOs). This kind of operations are important be-

cause of the frequency with which they occur. Alone in 1997 more than 10 NEOs were performed around the world.

2 Work to Date

We made an study of the application domain and designed an architecture for decision support during planning. These aspects are explained in detail in this section.

2.1 Study of the NEO Domain

A careful study of the domain was made following two information sources:

- Study of bibliography. We studied several unclassified documents which describe NEO doctrine and previous NEO operations performed around the world by the US Armed Forces.
- Interview with NEO experts. We interviewed NEO experts at that Center for Naval Analysis and maintained contact with them during all this period of time.

Based on these studies, we developed an knowledge base consisting of more than 200 tasks and cases.

2.2 Design of an Architecture for Planning

As a result of the study on NEO Operations, we conceived an architecture for decision support during planning called HICAP (Hierarchical Interactive Case-Based Architecture for Planning). HICAP is illustrated in Figure 1.

Now we will explain the components in the architecture that has been developed or are under development.

2.3 NaCoDAE/HTN

A conversational case-based reasoning tool, Nacodae, developed at NCARAI served as starting point for this project. It was extended to handle a plan representation technique known as Hierarchical Task Networks. This component is fully developed in Java 2.

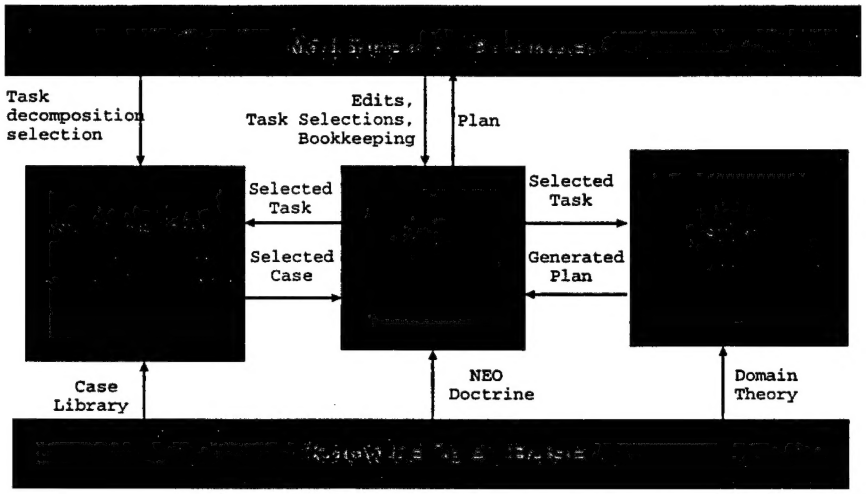

Figure 1: The HICAP architecture.

2.4 HTE

The Hierarchical Task Editor (HTE) has been conceived and developed to handle doctrinal tasks. Doctrinal tasks form a high-level plan. This component is fully developed in Java 2.

2.5 Initial Evaluation of the Architecture

An initial evaluation of the HICAP architecture was made including its NA-CoDAE/HTN and HTE components. This evaluation was performed by manually interacting with a military simulation tool called MoDSAF. The evaluation was a success and its results submitted for publication in a scientific conference.

2.6 SHOP

SHOP (Simple Hierarchical Ordered Planner) is a highly efficient generative planner developed at the University of Maryland. SHOP is being targeted to handle NEO tasks that requires numerical computations. A version of SHOP running on Java 2 is at an advance stage of development.

3 Plan for the Second Year

For the second year, we plan to complete the HICAP architecture, complete the knowledge base for NEO planning, perform a large-scale evaluation with ModSAF and integrate it with IDS.

Now we will explain these objectives with more detail.

3.1 Completion of the HICAP Architecture

Besides completing the implementation of SHOP and integrating it into HICAP, we will developed a dependency-maintenance system to ensure global consistency of the plans generated by HICAP. This is particularly important for dealing with user interactions.

3.2 Completion of the Knowledge Base

Although we have made a large knowledge base, several cases have not being integrated yet as first we wanted to make a proof of concept. For the second year we plan to integrate the additional cases to make the case base more robust.

3.3 Large Scale Evaluation

Once the other components of HICAP have been integrate and its knowledge base has been extended, we plan to perform a large-scale experiment using the MoDSAF simulation tool. The scope of the experiments will serve to not only evaluate the architecture but also the encoding of the knowledge base.

3.4 Integration of HICAP in IDS

HICAP is being targeted to serve as the plan formulation component for the Interactive Decision Support (IDS) system being developed at SPAWAR System Center. When completed, IDS will perform distributed plan formulation, execution, monitoring, and replanning for NEO planning efforts.

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